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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Patent Docket Administration
RAYTHEON COMPANY
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EXAMINER

MATZEK, MATTHEW D

ART UNIT	PAPER NUMBER
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1771

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/639,059	Applicant(s) THERIAULT, P. CHRIS	
	Examiner Matthew D. Matzek	Art Unit 1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 23-28 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-22 is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>ALL</u> . | 6) <input type="checkbox"/> Other: _____ |

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-22, drawn to a mirror, classified in class 442, subclass 59.
- II. Claims 23-28, drawn to a method of making a mirror, classified in class 502, subclass 527.24.

The inventions are distinct, each from the other because of the following reasons:

1. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the mirror of Group I may be made by creating an optical quality surface separate to the reinforced matrix and applying a reflective optical coating on the optical quality surface prior to its being attached to the reinforced matrix.
2. During a telephone conversation with John Gunther on 4/5/2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-22. Affirmation of this election must be made by applicant in replying to this Office action. Claims 23-28 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

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3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Applicant recites “substrate being characterized by a first scale that is a measure of the structure of the first fibers, said fiber reinforced layer being characterized by a second scale factor that is a measure of structure of the second fibers”. It is unclear to Examiner what is meant by “scale factor” and “measure of structure”. Please clarify through amendment of claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim 1 and 10-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al. (US Patent 5,428,483).

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7. Sato et al. disclose a lightweight, inexpensive reflecting mirror. A reflecting layer (12) is formed on the front surface of a carbon fiber-reinforced plastic substrate (52) with a second substrate (54) formed on the rear surface of the first substrate (Figure 5). The second substrate preferably consists of a carbon fiber-reinforced plastic (Abstract).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made:

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. The invention of Sato et al. has been previously disclosed, but was silent as to formation of the optical quality surface on another layer formed on the fiber reinforcement layer.

9. It would have been obvious to one of ordinary skill in the art to have put an intermediate layer between the fiber reinforced layer and the optical quality surface. The skilled artisan would have been motivated by the desire to eliminate "print-through" associated with the reinforced layer or the desire to have a layer of intermediate thermal conductivity or coefficient of thermal expansion in order to prevent damage due to thermal cycling.

10. Claims 2-4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. in view of Pollatta et al. (US Patent 5,554,430). The invention of Sato et al. has been previously disclosed, but was silent as to the dimensional relationship between the fibers used as reinforcement.

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11. Pollatta et al. disclose a boron/carbon 1D laminate comprising a boron fiber layer and a carbon fiber layer each embedded in plastic resin matrices. The laminates are useful for optical mounting structures (Abstract). Boron fibers are available in 75 μm , 100 μm , and 140 μm diameters (col. 3, lines 65-67). The carbon fiber ply thicknesses are 78.125 μm (col. 6, lines 10-11), therefore the diameters of the carbon fibers may be smaller than those of the boron fibers. Figures 1 and 3 further substantiate the use of a two-layer support for optical mounting structures comprising two different diameter fibers. Carbon fibers are very strong, stiff and lightweight and have diameters of 8-12 μm (Handbook of Composites).

12. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated the support structure of Pollatta et al. into the reflecting mirror of Sato et al. The skilled artisan would have been motivated by the desire to provide the mirror support with a low coefficient of thermal expansion (CTE).

13. Claims 8-9 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. in view of Pollatta et al. in further view of Weeks, Jr. et al. (US Patent 5,834,115). The inventions of Sato et al. and Pollatta et al. have been previously disclosed, but are silent as to the use of woven fiber reinforcement layers.

14. Weeks, Jr. et al. disclose a composite comprising a metallic substrate and woven graphitic fibers (Abstract and Examples 4 and 10). The composites of the applied invention possess a low CTE (claim 4).

15. It would have obvious to one of ordinary skill in the art to have used the woven reinforced composite of Weeks, Jr. et al. in the laminate of Pollatta et al. in creating the reflecting mirror of Sato et al. The skilled artisan would have been motivated by the fact that

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composite of Weeks, Jr. has a low CTE and the woven structure of the reinforcement would have provided greater dimensional stability than the 1D laminate of Pollatta et al.

16. It would have been obvious to one of ordinary skill in the art to have replaced the untowed fibers of Weeks, Jr et al. with towed fibers of less than 200 fibers. The skilled artisan would have been motivated by the fact that towed fibers provide greater mechanical integrity than untowed fibers.

17. Claims 5-7 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. in view of Yadav et al. (US Patent 6,228,904). The invention of Sato et al. has been previously disclosed, but was silent as to the use of nanometric scale reinforcement filler.

18. Yadav et al. disclose a nanocomposite comprising a nanostructured filler or carrier intimately mixed with a matrix (Abstract). The nanostructured filler may comprise one or more elements having p, d, and f orbitals, or it may comprise a compound of one or more such elements with one or more suitable anions, such as aluminum, antimony, boron, bromine, carbon, chlorine, fluorine, germanium, hydrogen, indium, iodine, nickel, nitrogen, oxygen, phosphorus, selenium, silicon, sulfur, or tellurium. The matrix may be a polymer (e.g., poly(methyl methacrylate), poly(vinyl alcohol), polycarbonate, polyalkene, or polyaryl), a ceramic (e.g., zinc oxide, indium-tin oxide, hafnium carbide, or ferrite), or a metal (e.g., copper, tin, zinc, or iron). Loadings of the nanofiller may be as high as 95%, although loadings of 80% or less are preferred (col. 1, line 66 – col. 2, line 14). The nanofillers of the invention can be inorganic, organic, or metallic, and may be in the form of powders, whiskers, fibers, plates or films (col. 3, line 64 – col. 4, line 1). The Examiner takes the position that invention of Yadav et al. comprises the use of single-walled nanotubes which diameters of less than 10 nm or 0.010

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micron. Yadav et al. is silent as to the orientation of the filler within the composite, therefore the Examiner takes the position that said filler has a random orientation throughout the composite. It is well known in the art that carbon nanotubes generally possess aspect ratios (l/d) in excess of 100.

19. It would have been obvious to one of ordinary skill in the art at the time of the invention to have made the fiber reinforced layer of the mirror support the nanocomposite of Yadav et al. The skilled artisan would have been motivated by the fact that nanotube reinforced composites provide enhanced mechanical, thermal, and electrical properties, possess a low CTE and may be thinner than traditional composites due to the smaller diameter of the reinforcing fibers/tubes.

Allowable Subject Matter

20. Claims 20-22 are allowed.

21. The following is an examiner's statement of reasons for allowance: the limitation of *submicron diameter* *E.C.* graphitic fibrils randomly bound within a carbon/carbon composite is not anticipated by prior art.

22. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew D. Matzek whose telephone number is (571) 272-2423.

The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mdm

MDM

Elizabeth M Cole
ELIZABETH M. COLE
PRIMARY EXAMINER